

Field Notes

VERMONT CENTER FOR ECOSTUDIES | *Uniting People and Science for Conservation*

Case of the Missing Coccinellidae

Searching for answers about Vermont's lost Lady Beetles

| BY EMILY ANDERSON

When I think of childhood, lady beetles often come to mind. Visiting my mother's office on sunny, warm afternoons, I watched as beetles in brilliant shades of red and orange scurried along window sills and up my outstretched finger. Believing that they were good luck, I would scoop them into my palm and watch as they took flight for a more secure location.

I am not alone in my youthful fascination with these multicolored insects. After all, how many children's stories feature friendly ladybugs? What I did not realize until becoming involved with VCE's new Vermont Lady Beetle Atlas is that these stories depict only a fraction of existing lady beetle species. What many readers may not realize is that the classic "red-with-black-spots" beetles often shown are not the only ones that call Vermont home.

The status of our state's lady beetle spe-
(continued on page 10)

Three-banded
Lady Beetle >

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FIELD NOTES

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The Vermont Center for Ecostudies (VCE) is a nonprofit organization whose mission is to advance the conservation of wildlife across the Americas through research, monitoring, and citizen engagement. With a reach extending from Canada and northern New England through the Caribbean and South America, our work unites people and science for conservation.

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VCE VIEW



A wet and bedraggled biologist with a hard-earned Bicknell's Thrush banded in Cuba.

© LEYDIS ZALDIVAR

Continental bird populations are under assault. Scientific evidence leaves not a shred of doubt: nearly 30% of North America's birds—some 3 billion individuals in all—have disappeared in the past 50 years. Causes are varied and complex, but they include habitat loss and degradation, intensification of industrial agriculture, and global climate change.

Until recently, U.S. citizens could trust in the century-old Migratory Bird Treaty Act (MBTA) to help counterbalance this avian conservation crisis. Since 1918, this bedrock law has outlawed the hunting, killing, capturing, or collecting of migratory birds—and their eggs or nests—without a permit. From loons to longspurs, terns to tanagers, the MBTA protects migratory birds, and the myriad values—recreational, ecological, economic, and spiritual—by which they enrich our lives.

That landmark piece of legislation is now under siege. For decades, courts have interpreted the MBTA as applying to “incidental takes”—the unintentional harm or death of a bird that is the direct and foreseeable result of a person or entity's actions. Over the past 50 years, this legal interpretation has compelled industry to use best practices, whether covering oil waste pits or spacing electrical power lines to avoid electrocution, that have prevented countless avian deaths. In late 2017, the Department of Interior

(DOI) issued a memo reinterpreting the law to apply only to direct and purposeful harm or death. Under DOI's decision, entities that kill or harm birds through chemical contamination or oil spills, for example, will no longer be liable. The current administration has now proposed to legally encase that position in an administrative rule.

Effectively, killing birds will become legal if done unintentionally.

Billions of birds, not to mention the ecological services and recreational benefits they provide, are at stake. Thankfully, conservation activists at both the federal and state level are stepping up to try to fill the conservation gap. Nationally, H.R. 5552—the Migratory Bird Protection Act—is under consideration. This bipartisan bill would amend the MBTA to reestablish that, contrary to the administration's reinterpretation, the law prohibits incidental take. In line with other states, Vermont has introduced H.683, “an act relating to prohibiting incidental take of migratory birds.” VCE partner Audubon Vermont is working hard to ensure passage of this far-sighted law, with broad support from the statewide bird conservation community.

As a conservation science organization, VCE generally lets our science do the talking. We do not wade into policy issues often, or lightly. In this case, the science is clear, and the conservation impacts indisputably damaging. We must all make our voices heard. VCE has submitted comments to U.S. Fish & Wildlife Service opposing the proposed MBTA rule change. We implore each of you to take your own action for birds, by (1) urging Congress to support H.R.5552 (<https://www.contactingcongress.org>), and (2) urging Vermont's legislators (<https://legislature.vermont.gov/people/all/2020/House>) to support H.683. Birds that we all cherish, and that VCE seeks to conserve, with your support—from Bicknell's Thrushes to Bobolinks, Whip-poor-wills to Northern Waterthrushes—hang in the balance. The time to act is now. **FN**



© SPENCER HARDY

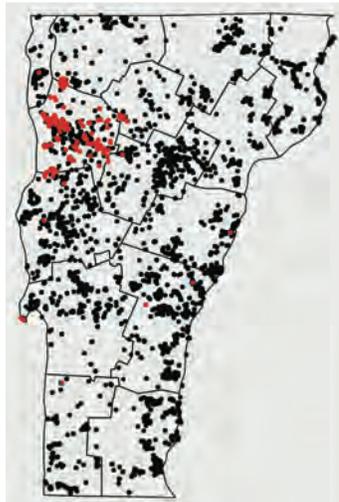
State of Vermont's Bees

An update from the off-season

| BY SPENCER HARDY

The Vermont Wild Bee Survey (VTBees) team was busy as... well, bees in 2019. From the mouth of the Winooski River to the summit of Mount Mansfield, we and our citizen scientists collected roughly 9,000 bee specimens and located an additional 20,000+ records going back as far as the 1930s. Many of the historic specimens came from regional university museum collections, including several thousand from the Zadock Thompson Zoological Collections at the University of Vermont. Combined, these records form the most comprehensive data set ever assembled on Vermont's bees, elevating our state from one of the East's most data-deficient regions to one of the richest!

Collecting specimens is only the first step in the VTBees research protocol. Each new specimen must be washed (and blow-dried), identified, cataloged, and prepared for long-term storage. This spring, we'll complete identification of the remaining ~2,000 undetermined specimens, at which point the first-ever checklist of Vermont's bees will be ready for publication. This list will be regionally significant, documenting substantial range expansions and the continued existence of several very rare species. A 2012 published study analyzed all 770 species of bees known from eastern North America, and found only 37 species that had not been documented between 1990 and 2010. Amazingly, two of these 37 species were unearthed by VTBees. One, the Canadian Cellophane-cuckoo Bee (*Epeolus canadensis*) was caught this summer by VCE's Nathaniel Sharp in Colchester. The other, Sixteen-spotted



DISTRIBUTION OF VERMONT'S BEE RECORDS

Black dots indicate records from the Global Biodiversity Information Facility, which includes research grade iNaturalist observations and data from the Vermont Bumblebee Atlas. Red dots are 2019 records from VTBees.

Cuckoo Carder Bee (*Stelis permaculata*) was collected in August 2007 by VTBees collaborator, Leif Richardson. This particular specimen was collected in Cornwall Swamp, and had been sitting in a box—unidentified—until this fall! Of course, there were many other surprises in 2019, and we're certain many more are yet to come.

Over the next two summers, we will focus our efforts in southern Vermont. With at least two additional field seasons ahead, we expect to further expand the statewide species list while tailoring our fieldwork to produce data with meaningful conservation outcomes. Core to our success will be exciting collaborations with regional partners, including Green Mountain National Forest and Merck Forest and Farmland Center. These partnerships will increase the impact of our work by providing landowners with bee data that would otherwise be prohibitively expensive and impractical for them to collect independently.

Even though we added dozens of species to the state list in 2019, there are certainly species out there that have so far avoided our nets. For example, we'll make a concerted effort this spring to find two genera that have been collected in neighboring states. The genus *Mellita* contains three rare species in the Northeast, all of which are pollen specialists, including one that requires Deerberry (*Vaccinium stamineum*) which occurs sporadically in southern Vermont. The Southeastern Blueberry Bee (*Habropoda laboriosa*) is another *Vaccinium* specialist that likely reaches the northern extreme of its range in southern Vermont. If last season was any guide, some of our most intriguing VTBees finds in 2020 will be made by camera-toting citizen scientists who post bee photos on iNaturalist. Who knows, that little bee in your garden could be a first state record! Learn more at <http://val.vtecostudies.org/projects/vtbees> **FN**



Many species, including Eastern Wood-Pewee, whose populations have declined in Vermont by 35% over the last 25 years, may benefit from bird-friendly maple management.

© ANDY REAGO & CRISSY MCCLARREN

Is Bird-friendly Maple Sweet for Birds?

VCE partners with Audubon Vermont and UVM to test forest management guidelines for maple producers

BY STEVE FACCIO

You've likely heard of "bird-friendly" coffee, but how about bird-friendly maple? Forests that produce maple syrup can be managed in very different ways—some of which may provide better habitat for birds than others. In a new partnership with Audubon Vermont and the University of Vermont, VCE is spearheading a two-year study that will test whether the management recommendations of Audubon Vermont's Bird-friendly Maple Project produce measurable benefits for birds compared to a more traditional approach of sugarbush management.

Traditional sugarbush management



techniques focus on maximizing sap production. This frequently results in park-like, closed-canopy monocultures of mature sugar maple with little to no understory. This lack of plant diversity and habitat structure may reduce the forest's value for birds and other wildlife, and, as any gardener knows, monocultures tend to be more susceptible and less resilient to disease and pests.

To address these issues, Audubon Vermont's Steve Hagenbuch, in partnership with the Vermont Department of Forests, Parks, and Recreation and the Vermont Maple Sugar Maker's Association, initiated the Bird-friendly Maple Project to promote sugarbush



© SUSAN HINDINGER

You don't need a background in science to be a Citizen Scientist!

From backyards and bogs to mountains and meadows, you'll find many ways to get involved and make a real contribution to wildlife conservation. If you'd rather not muck around a swamp or hike to a summit, you can still volunteer for VCE—even from the comfort of home.

We hope you'll join us!

iNaturalist Vermont

Volunteers share observations of all Vermont biodiversity in this digital project of the Vermont Atlas of Life.

www.inaturalist.org/projects/vermont-atlas-of-life

Mountain Birdwatch

Each June, volunteers hit the trails to complete bird survey routes on 123 mountain ridgelines across the Northeast.

vtecostudies.org/projects/mountains/mountain-birdwatch

Vernal Pool Monitoring

In April, May, and September each year, volunteers visit and collect data to monitor “adopted” vernal pools following protocols and using using VCE-provided equipment.

vtecostudies.org/projects/forests/vernal-pool-conservation

To learn more about the Vermont Atlas of Life and its projects, visit vtecostudies.org/volunteer

The question our two-year study aims to answer is this: Do these management guidelines actually result in measurable benefits to the bird community compared to traditionally managed sugar bushes or unmanaged forests?

management practices that strive to improve forest habitat value, native plant diversity, and long-term productivity. As Hagenbuch points out, “The future of Vermont’s forest health, bird populations, and maple sugaring industry are tightly linked—the same northern hardwood forests that supply nearly one-half of our nation’s maple syrup each year also support some of the highest diversities and abundances of breeding birds in the continental United States.”

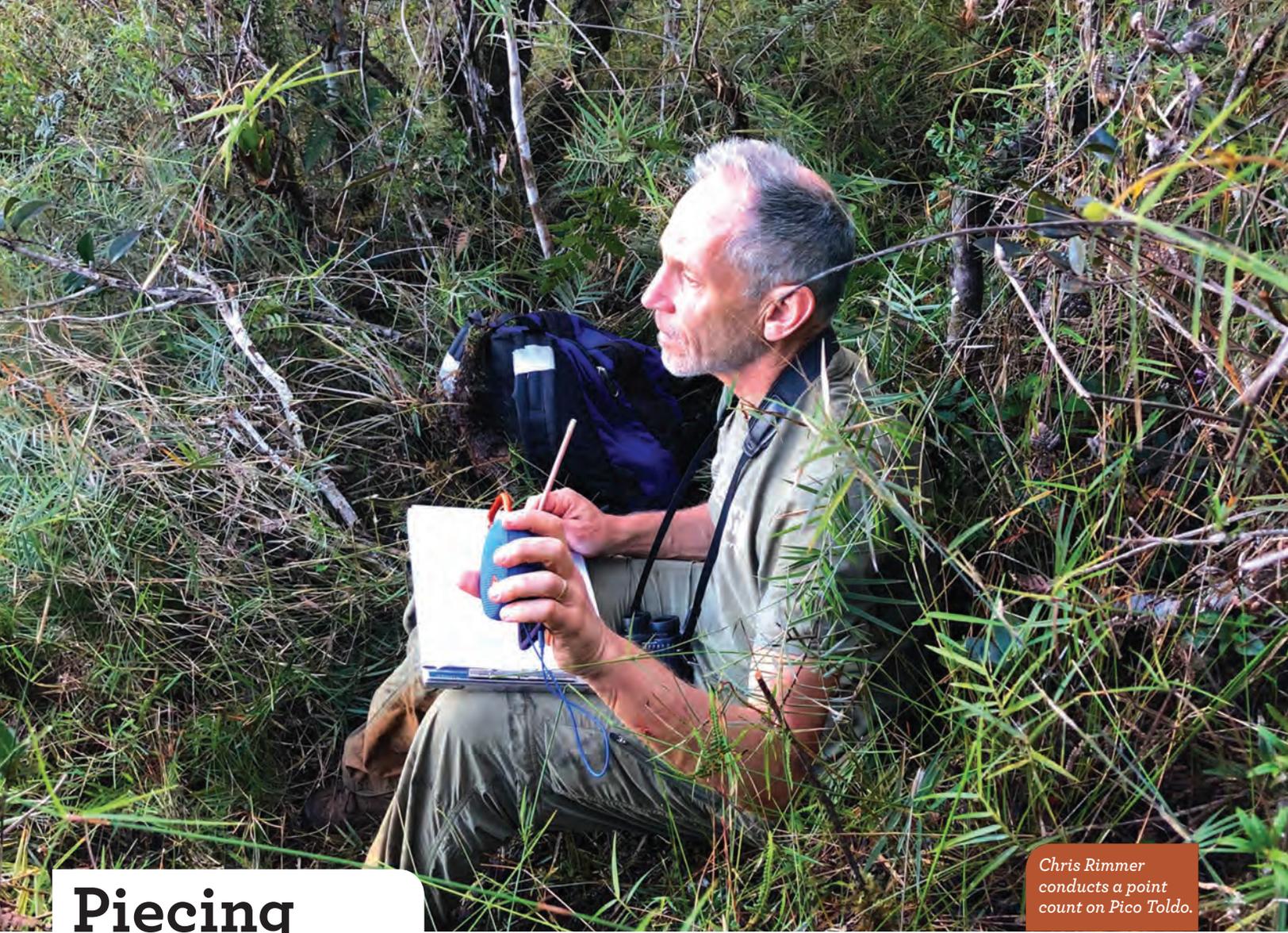
Moreover, results from VCE’s Forest Bird Monitoring Project revealed that many of these birds, including Canada Warbler, Veery, and Eastern Wood-Pewee, have experienced population declines in Vermont forests over the last 25 years. Stressors associated with climate change, forest fragmentation, invasive species, and incompatible forest management practices are contributing threats to forest birds. These same factors also threaten the sustainability of maple sugaring at a time when the industry is expanding rapidly. Since 2015, maple production in Vermont has increased by 40%, and this steady growth is predicted to continue for the foreseeable future. As a consequence, more and more forestland is being managed for maple production—potentially

in ways that degrade habitat for birds (and biodiversity in general), while negatively impacting ecosystem services delivered by working forests.

Audubon’s Bird-friendly Maple Project works with participating maple producers to sustainably manage their forests for birds *and* sap. In exchange, they receive promotional materials that allow them to uniquely market their syrup as “bird-friendly.” Specifically, Audubon’s management guidelines recommend increasing the diversity of canopy tree species and forest structure by ensuring a range of age classes from seedlings to large trees. This, in turn, encourages forest regeneration, creates a variety of complex forest layers, and promotes long-term health, resiliency, and sustainability of the sugarbush.

The question our two-year study aims to answer is this: Do these management guidelines actually result in measurable benefits to the bird community compared to traditionally managed sugarbushes or unmanaged forests?

Beginning this summer, we will address that question by quantifying birds and their invertebrate prey in three different forest treatments: 1) sugarbush stands that meet Audubon’s criteria, 2) sugarbush stands managed as maple monocultures, and 3) unmanaged forest stands. Additionally, our study will be part of a larger project by University of Vermont professors Brendan Fisher, Tony D’Amato, and Rachele Gould, who will not only investigate how the intensity of maple sugar production affects biodiversity, but will assess its impact on ecosystem services (such as carbon sequestration and resistance to invasive species) while investigating the socio-economic outcomes of maple production at different scales. Ultimately, we hope the results will help improve Audubon’s sugarbush management guidelines and advance biodiversity conservation in Vermont’s working forest landscape. Stay tuned for updates on this sweet project! **FN**



Chris Rimmer conducts a point count on Pico Toldo.

Piecing Together the Puzzle

Studying the enigmatic Bicknell's Thrush in Cuba

BY CHRIS RIMMER

January 28, 2020 2:50 am.

I guzzle highly sweetened coffee and bolt a few crackers. Five of us—Cuban biologists Freddy Santana and Alan Mendez, field technician Yunier Cagnet (aka Fis), our park guide Camelo, and I—set off in a silent procession under fiercely starry skies, headlamps our only light, plodding boot steps and “tinking” tree frogs the only sounds. We need to cover 12 kilometers before dawn, the witching hour of Bicknell’s Thrush.



Day three of our weeklong field survey of El Toldo, a wilderness high-elevation plateau deep inside eastern Cuba’s 71,000-hectare Alejandro de Humboldt National Park, has begun. Today’s target is Pico Toldo, the Park’s highest summit at nearly 1,200 m. Camelo expresses doubt that we’ll find a navigable trail up the peak’s steep slopes of dense “cloud charrascal” forest. Undaunted (we’re armed with machetes, after all), we hike on. Conversation is scant, but hopes high for our first encounter with Bicknell’s Thrush. After two days of unrewarded surveys in patches of broadleaf “pluvisilva” forest embedded within the boundless Cuban pines, we feel our luck will turn.

If VCE has learned anything in 28 years of studying Bicknell’s Thrush, it’s that predictable outcomes don’t exist with this bird. We think we have our quarry figured out, and, suddenly, we don’t. I was back in Cuba for a fourth consecutive winter because Bicknell’s Thrush had thrown us a curveball the previous February.

Following our unforgettable expedition to the remote cloud forests of Sierra Maestra's Bayamesa National Park, which yielded several thrushes, we had surveyed an expanse of high-elevation broadleaf-pine forest in central Humboldt. Descending from the highlands, no Bicknell's Thrushes under our belt, we were shocked to stumble on a vocalizing bird in disturbed, secondary forest at 650 m elevation, near the tiny hamlet of Riito. We netted and banded the bird—a yearling. Was this an outlier, a naïve youngster, perhaps unable to secure a territory in prime habitat, who had settled for the best he or she could find? The plot thickened when, two weeks later, my Cuban colleagues returned to confirm this bird's continued presence, then found three additional thrushes nearby!

Our thinking about Bicknell's Thrush distribution and habitat selection in Cuba had been turned on its head, necessitating a 2020 follow-up field trip. We needed to not only carefully investigate the situation at Riito, but more exhaustively survey an array of "non-traditional" habitats. So, now, in late January, while my team scours pluvisilva and charrascal forests on the El Toldo plateau, Cuban colleague Nicasio Viña is leading a team back in Riito. However, we soon learn that four days of concerted point counts and playbacks there revealed no thrushes anywhere. How to explain this absence, after the presence of four birds in 2019? We'll never know for sure, but we can surmise that these may have been young, inexperienced birds, who adopted a "floater" strategy, moving constantly through suboptimal habitat or inhabiting patches only temporarily. This is well-documented in other migrant songbirds that, like Bicknell's Thrush, occupy discrete winter territories. Not everyone secures a piece of prime real estate.

Back to El Toldo, 5:50 am:

Exactly three hours after our coffee-fueled departure from camp, the first

glimmer of dawn appears. Twenty minutes later, we arrive at the base of Pico Toldo, headlamps now off. As feared, no trail ascends the impenetrable bamboo charrascal understory to the summit, so Camelo and Fis gamely set off with machetes to create one. At 6:20, Freddy, Alan and I begin point counts along the old mining road we've just hiked. Habitat looks promising, as it has elsewhere in El Toldo, but Bicknell's Thrush are nowhere to be found. Three signature endemics dominate the airwaves: Cuban Trogons, Cuban Todies, and Cuban Solitaires. Trail cutting proves too arduous for our comrades, so we climb only halfway up Pico Toldo. No thrushes there either.

Over the next four days, we learn a great deal about where Bicknell's Thrush are *not*, which is anywhere on the El Toldo plateau, or, apparently, inside Humboldt National Park. We backpack out of the park, reunite with Nicasio's team, and move to wet lowland karst forest in Carso de Baire, where a quick 24-hour survey also comes up empty. Needing to hear at least one Bicknell's Thrush in 2020, we end our expedition at Pico Botella, Sierra Maestra's only road-accessible tract of cloud forest. There we find a handful of our quarry, managing to net and band two birds.

These three weeks, and, in fact, the past four winters leave us with an inescapable but unsurprising conclusion: Bicknell's Thrush is a cloud forest specialist on Cuba. That is somewhat disappointing, as we'd hoped to discover populations overwintering in other habitats. Cuba is remarkably well-conserved overall, a far cry from the species' core winter range on Hispaniola. Yet our Cuban findings are vitally important, as they reaffirm the strategic need to continue focusing conservation efforts in Haiti and the Dominican Republic. Without doubt, Cuba provides critical and secure refuge for Bicknell's Thrush, even if it doesn't harbor a mother lode. Moreover, our colleagues there are deeply committed to further collaboration as we together study and conserve this globally vulnerable species. **FN**

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The VCE-BIOECO team's camp dining space on the banks of Rio Piloto in El Toldo.



Dr. Yolanda León during a 2014 field trip in Sierra de Bahoruco

© CHRIS RIMMER

Yolanda León

VCE colleague receives prestigious conservation award

| BY CHRIS RIMMER

Long-time VCE partner and Advisory Council member, Yolanda (Yoli) León, is a true conservation champion—and warrior (in the best sense of that term). Her efforts to achieve science-based habitat conservation in her native Dominican Republic have more often than not gone against the grain of political realities, economic pressures, and social norms. They have also raised tremendous public awareness, enriched local communities, and brought about hard-won change.

Yoli's tireless work was recently recognized via a prestigious 2019 Partners in Flight (PIF) Individual Leadership Award. Since 1990, PIF—a hemispheric coalition of 150 bird conservation organizations—has promoted and shepherded partnerships to advance landbird conservation. PIF's annual Leadership Award "honors an individual or group who demonstrates outstanding guidance and direction that contributes, or has contributed to, advancing PIF conservation efforts." Yoli fulfills those criteria in spades. Over the past decade-plus, her collaborative, groundbreaking work has targeted Sierra de Bahoruco's extraordinarily biodiverse, ecologically critical and extremely vulnerable forests—a region severely threatened by chronic, accelerating habitat loss and degradation, much of it occurring illegally within national park boundaries. Bicknell's Thrush and associated overwintering migrant birds may be the explicit targets of Yolanda's ongoing conservation efforts in Bahoruco, but the ecological and societal impacts of her work reach much deeper. VCE salutes our close friend, colleague, advisor, and conservation advocate on her well-deserved award. We look forward to strengthening our long and productive collaboration. Congratulations, Yoli! **FN**



© TARA RODKEY

Mountain Birdwatch

20th anniversary

If you like to hike and wake up to the sound of bird song, then VCE could use your help this June. Mountain Birdwatch (MBW) is VCE's long-term mountain bird monitoring program, with 129 survey routes located on high-elevation hiking trails across the Catskills and Adirondacks, New Hampshire, Vermont, and Maine. On one morning in June, citizen scientists conduct simple counts for only 10 montane bird species, such as Bicknell's Thrush, Winter Wren, and Blackpoll Warbler. The short list of monitored species means that any hiker who likes to bird can participate. You don't have to be an expert, just enthusiastic. Since 2010 alone, nearly 400 citizen scientists have conducted more than 20,000 point counts in mountains of the northeastern U.S. These data, and our resulting analyses, have profoundly influenced the management and conservation of our montane bird communities.

Visit vtecostudies.org/projects/mountains/mountain-birdwatch/participate to learn more and explore a map of available routes. Don't hesitate to contact MBW coordinator Jason Hill (jhill@vtecostudies.org) with your questions, or to sign up! **FN**

Spring into Action

Volunteer for vernal pools

Does the thought of leaving the beaten path in search of vernal pools and the critters that call them home make your heart sing? Do you think collecting data is fun? If you answered "Yes!" to these questions, we have a (volunteer) job for you!

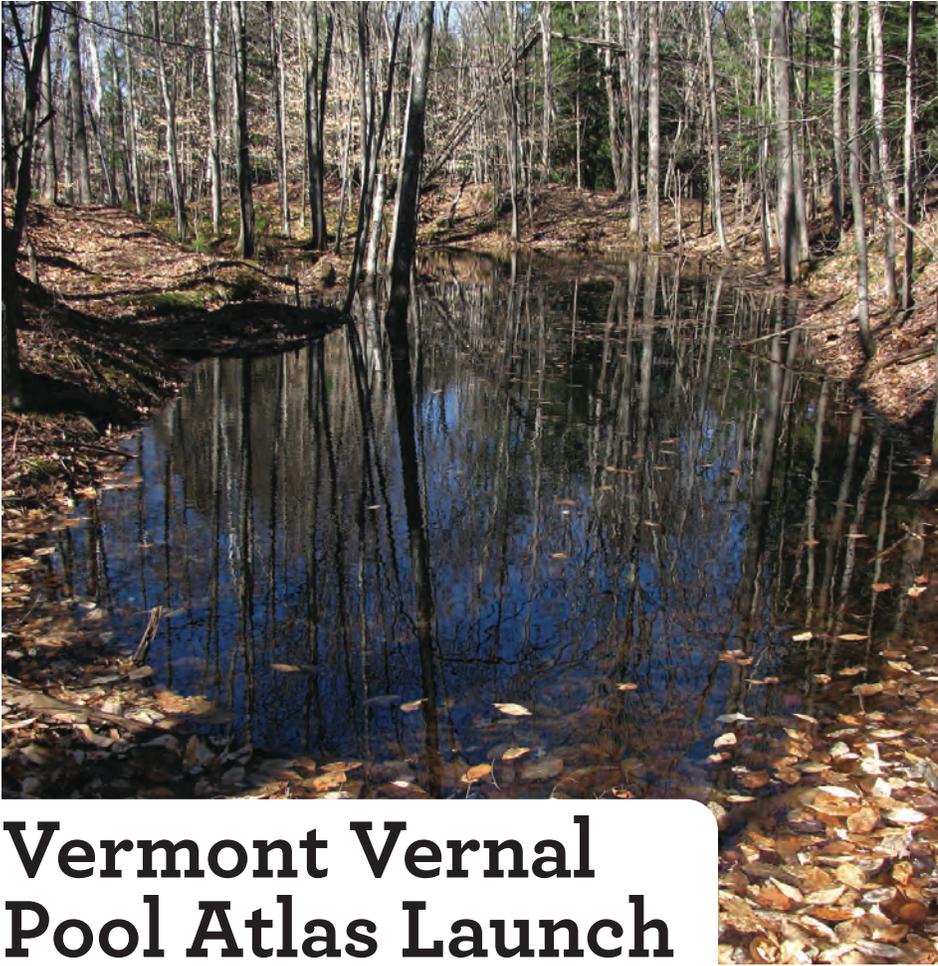
VCE's Vernal Pool Monitoring Project (VPMon) is looking for citizen scientist volunteers to monitor pools throughout Vermont for the upcoming spring (and beyond), with an emphasis on finding monitors in Essex, Caledonia, Orleans, Lamoille, and Franklin counties. Monitors make four visits to a single vernal pool throughout the year. No prior experience is needed.

Visit vtecostudies.org/projects/forests/vernal-pool-conservation/vermont-vernal-pool-monitoring-project to learn more. Ready to sign up? Have questions? Email VCE's VPMon Coordinator, Kevin Tolan, at vpmon@vtecostudies.org. **FN**



► Blue-spotted Salamander

© ISTOCK



Vermont Vernal Pool Atlas Launch

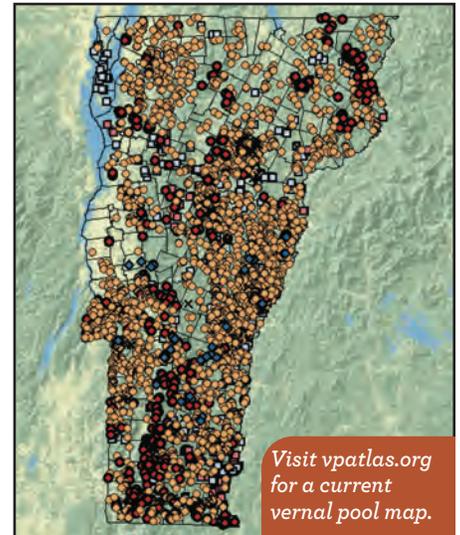
An interactive mapping tool and clearinghouse for all things vernal pool in Vermont

| BY JASON LOOMIS AND STEVE FACCIO

Each spring, small wetlands scattered throughout northeastern woodlands erupt with life. Diminutive Fairy Shrimp, quacking Wood Frogs, and three charismatic salamander species rely on these wetlands, called vernal pools, for their very existence. In an effort to conserve and protect these vital, ephemeral habitats, VCE—in collaboration with Vermont Fish & Wildlife Department (VFWD)—created the Vermont Vernal Pool Atlas (VPAtlas), a state-wide repository of vernal pool data. VPAtlas is a web-accessible database of vernal pool location and monitoring information, as well as an interactive citizen science data-gathering portal that welcomes public use. Anyone can learn how to use VPAtlas and contribute to this community resource by recording observations of vernal pool locations, indicator species, and more.

VPAtlas is also the source of vernal pool data for the Vermont Agency of Natural Resources (ANR), whose staff use this information for a variety of purposes, including conservation planning, enforcing wetland regulations and Act 250 reviews, and forestry and research activities. VPAtlas provides automated, periodic updates to the vernal pool layer on ANR's Natural Resources Atlas, a web-based mapping platform featuring over 150 different mapping layers that is widely used by natural resource professionals, land managers, and landowners.

VPAtlas is an outgrowth of VCE's Vernal Pool Mapping Project (initiated in



2008), which mapped the locations of over 4,000 remotely-sensed “potential” pools as well as several hundred field-verified pools. Along with our partners at VFWD and Arrowwood Environmental, VCE’s long-term vision for the vernal pool mapping data is that it not be a static “snapshot-in-time” map, but one that can be easily updated as new pools are discovered or potential sites are confirmed through field visits.

VPAtlas achieves this vision with an interactive, web-based platform that allows visitors to view and search mapped pools and register to become VPAtlas users. Once registered, VPAtlas users can add pool data, including “new” pools that have not been previously mapped, as well as new “visits” to previously-mapped pools. VPAtlas administrators review and validate all entries to ensure data integrity.

Currently in Beta release and still under development, VPAtlas can be found at <https://vpAtlas.org>. We welcome visitors to the site and encourage users to begin adding pool data. You may encounter unexpected issues when using the site during the next 6-12 months as we work to eliminate bugs and add additional features. Please contact vpAtlas@vtecostudies.org with any questions or to report software issues. If you'd like to join our team of citizen scientists and more formally “adopt” a pool to monitor, please contact us at VPMon@vtecostudies.org. **FN**



The Convergent Lady Beetle, above, has not been spotted in Vermont since 1978. At left: Parenthesis Lady Beetle

© LINDSEY DUVAL

© DAVID ENRIQUE

Join VCE's Lady Beetle Blitz in May

Help us kick off the Vermont Lady Beetle Atlas with a week-end-long Lady Beetle Blitz, May 16th and 17th. We're asking people all across the state to search their yards, gardens, and everywhere else to help us discover these beautiful beetles. Anyone can do it, and it's fun! You can also learn more about these fascinating beetles and join VCE staff on a beetle hunt at the North Branch Nature Center in Montpelier from 1-4pm May 16th. Please contact VCE's Citizen Science Outreach Naturalist, Emily Anderson (eanderson@vtcostudies.org) if you have any questions.

cies was hardly on Kent McFarland's radar when he asked Jason Loomis, VCE's Software Developer, to digitize a historic Vermont Lady Beetle report. But often, the best ideas appear when we least expect them.

"We're always on the lookout for historic natural history data," explains Kent. "When we find them, our mission is to rescue them from potential oblivion in the dustbin of history. We had a 43-year-old document which provided a snapshot of lady beetle life prior to 1976—*Lady Beetles: A Checklist of the Coccinellidae of Vermont*. Jason began pulling the records into a database, and we quickly realized that many of the beetles reported hadn't been seen in decades."

As VCE's Vermont Atlas of Life team scoured historic Vermont collections for more data, a clear picture emerged of all 40 lady beetle species ever recorded in the state. Of these 40, seven species are nonnative—including the Asian lady beetle, a frequent house guest in cold winter months. The team made another disturbing discovery: 13 native species are currently missing. Since the 1970s, species that were once considered common, like the Nine-spotted

Lady Beetle, have completely vanished. A quick literature search revealed several theories to explain recent declines, but many scientists believe that invasive lady beetles and land use changes have played key roles.

These missing species create more than an alluring research mystery—they may also leave ecosystems more vulnerable to environmental changes. In nature, diversity assures stability. Most lady beetles are voracious predators that help keep plant pests in check. Resource overlap can occur when multiple similar species occupy an ecosystem, creating competition, but also insurance; if one species disappears, another often takes its place, maintaining ecosystem stability. However, this role redundancy is reduced when fewer species occupy the ecosystem. If one vanishes and is not replaced, ecological relationships may be compromised and ecosystem functioning diminished.

Agriculture and managed forests may get hit relatively hard when lady beetle diversity declines. Many beetles protect agroecosystems by devouring crop-destroying pests. Scientists currently lack a clear picture of how local

declines or extirpations may affect agroecosystem stability in the era of climate change; however they could amplify other negative impacts that already threaten many farms.

Are Vermont's missing beetle species really gone, or have we just not been looking closely enough? With the help of volunteer community scientists, we're hoping to find out. Searching for lost lady beetles is not a new pursuit. In 2000, Cornell University and collaborators created the Lost Ladybug Project (LLP) to discover whether missing species in New York were truly extirpated or just existed in extremely low population densities. By harnessing a network of citizen scientists, LLP set to work combing all manner of terrestrial habitats from shrubby hillsides to ornamental gardens—with some success. Throughout their survey (2008-2012), volunteers uncovered three species unseen in New York since the 1970s: the Convergent Lady Beetle, Two-spotted Lady Beetle, and Nine-spotted Lady Beetle.

LLP's discoveries make us hopeful

about the status of Vermont's missing lady beetles and emphasize the importance of community science. Lady beetles are needles in a haystack, and we need more than a handful of scientists to definitively identify their whereabouts (or presumed absence). This summer, we will engage volunteers across Vermont to search for our missing species, and to help establish a statewide baseline of data. Supported by a community of volunteer scientists who are excited to help solve this insect mystery, we will have a much better chance of success, and ultimately of conserving these amazing insects.

Today, this project has me looking at lady beetles in entirely new ways. Long past believing in their luck-granting abilities, I still find myself enraptured by their diverse patterns and colors. In the coming months, I hope you, too, will take a closer look at the multicolored beetles that share your neighborhood. You might just discover a long-lost species! Learn more at <http://val.vtecostudies.org/projects/lady-beetle-atlas> 

The Missing Lady Beetles of Vermont

COMMON NAME	LATIN NAME	LAST REPORTED IN VERMONT
Convergent Lady Beetle	<i>Hippodamia convergens</i>	1978
Four-spotted Spurleg Lady Beetle	<i>Brachiacantha quadripunctata</i>	1976
Nine-spotted Lady Beetle	<i>Coccinella novemnotata</i>	1976
Transverse Lady Beetle	<i>Coccinella transversoguttata</i>	1976
Firefly Duskyling	<i>Diomus terminatus</i>	1976
Glacial Lady Beetle	<i>Hippodamia glacialis</i>	1976
Undulate Sigil Lady Beetle	<i>Hyperaspis undulata</i>	1976
Unnamed	<i>Scymnus fraternus</i>	1973
Two-spotted Lady Beetle	<i>Adalia bipunctata</i>	1971
Ten-spotted Spurleg Lady Beetle	<i>Brachiacantha decempustulata</i>	1971
Esteemed Sigil Lady Beetle	<i>Hyperaspis proba</i>	1969
Thirteen-spotted Lady Beetle	<i>Hippodamia tredecimpunctata</i>	1913
Five-spotted Lady Beetle	<i>Hippodamia quinquesignata</i>	1890



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West Virginia White { *Pieris virginiensis* }



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Like the flowers that nourish them, West Virginia Whites are spring ephemerals.

BY KENT MCFARLAND



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Cutleaf Toothwort
(*Cardamine concatenata*)

It's not a gaudy butterfly. It isn't the biggest or the smallest. In fact, it's mostly just white. But this butterfly is unusual—it only flies in forests. To see this butterfly, you need to visit a rich, mature hardwood forest carpeted with spring wildflowers. West Virginia Whites fly slowly and close to the forest floor. Follow a woodland stream until you find the host plants—and the butterfly.

The West Virginia White is almost completely white above with some gray scaling on the forewing. Below, the wings are whitish with veins outlined in pale gray scales. It is often confused with the Mustard White, which by contrast shows distinct, dark green-black veins on the underside of the hindwing during its spring flight.

Adult butterflies sip nectar from spring ephemeral wildflowers like Toothwort (*Car-*

damine spp.), Spring Beauty (*Claytonia virginica*), Violets (*Viola* spp.), and others, perhaps pollinating some of them along the way. Their caterpillars feed only on Toothwort and Rock Cress (*Boechera*). Like the flowers that nourish them, West Virginia Whites are spring ephemerals.

Spring ephemeral wildflowers are perennial woodland plants that sprout from the ground early, bloom quickly, and then go to seed—all before the canopy trees overhead leaf out. This strategy allows plants to take advantage of full sunlight that reaches the forest floor during a short time in early spring. Once the forest floor is deep in shade, the plant's leaves wither away.

Closely tied to healthy hardwood forests, some West Virginia White populations are declining or have disappeared altogether through habitat loss, high populations of deer over-browsing understory plants, climate change, and spread of the introduced weed Garlic Mustard (*Alliaria petiolata*).

Garlic Mustard was first found in the U.S. around 1868 on Long Island, New York and has since spread throughout the West Virginia White's range. Adult butterflies are fooled by Garlic Mustard. The plant's chemistry makes it inviting for females to lay eggs on the leaves, but once they hatch, the caterpillars quickly die from ingesting alliarinocide, a compound unique to Garlic Mustard. When it is present, West Virginia Whites place nearly two-thirds of their eggs on Garlic Mustard, rather than their preferred native host plants.

You have to hurry to see this butterfly. As soon as canopy leaves burst and shade the forest floor, adults are gone until the next year, when, if all goes well, a new generation flies again. **FN**